THE CURRENT ROLES OF NATURAL GAS AND LNG IN CALIFORNIA

Natural Gas

Natural gas is a hydrocarbon gaseous mixture composed primarily of methane, with small amounts of other gases, including propane, butane, and pentane. It may also contain liquid hydrocarbons such as ethane and natural gasoline, depending upon the particular underground deposit from which it is produced. Natural gas deposits are often located together with oil. In these conditions, the natural gas is collected during the extraction of the oil. Natural gas recovered in this manner is referred to as "associated gas" since its recovery is associated with oil production.

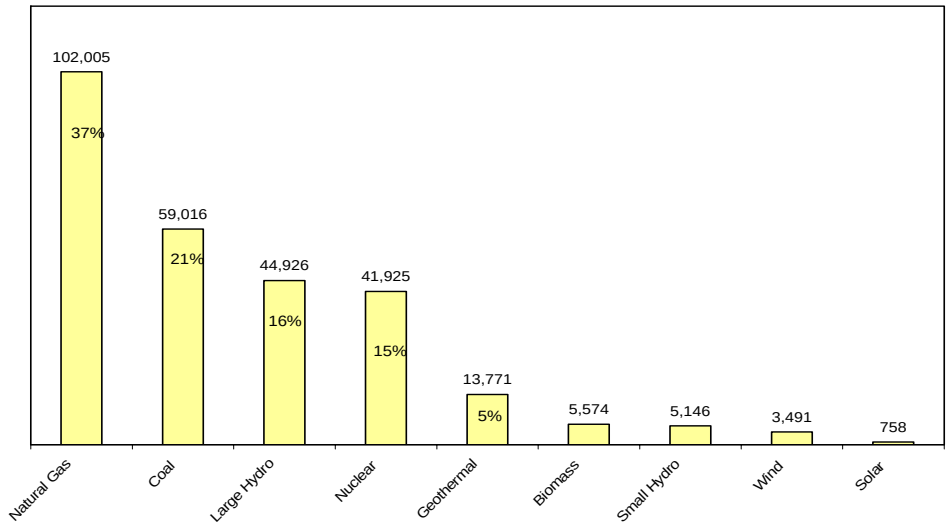
Natural gas is also found underground by itself, most often as molecules trapped under pressure in rock, or occasionally in underground pockets, such as in coal seams. Natural gas can be found either onshore or offshore, and at depths as much as 15,000 feet or more beneath the surface. Once the gas stream is extracted from beneath the surface, the liquid hydrocarbons and much of the foreign gases are processed out of the gas stream, resulting in a non-corrosive, clean-burning product suitable for residential, commercial and industrial purposes. The liquid hydrocarbons and foreign gases removed from the gas stream are collected and resold. Being composed almost entirely of methane, the processed gas stream is odorless and tasteless. For safety purposes a sulfur-based oderizing agent, called mercaptan, is injected into the gas stream by local gas companies to provide the characteristic "rotten eggs" smell.

The uses of natural gas are varied. It is used as a feedstock, for instance in fertilizer production, where the chemicals within the natural gas are separated and used to make other products. Because of its precise heat characteristics and clean-burning nature, natural gas is used in many other industrial applications, such as glassmaking and to fire ovens for baking microchips.

Natural gas is also a major fuel in electric generation. In 2003, natural gas supplied the fuel for approximately 37% of the electricity consumed in California. 96% of new electric generation added in the state during 2003 is fueled by natural gas, with the remaining balance fueled by renewables, such as wind power. Annually, more electricity is fueled by natural-gas than any other fuel source. For this and other reasons, the price of natural gas is major contributor to the price paid for electricity. For example, the Federal Energy Regulatory Commission determined that abnormally high prices for natural gas used as electric generation fuel contributed to California's "energy crisis" of 2000-2001.

The amount and percentage of California's electricity generated in 2003 by natural gas, as compared to other fuels, is shown in Chart I, below:

Chart I.
Fuel Source for Electricity Consumed in California – 2003
(gigawatt hours)



Natural gas has commercial and residential uses for space heating, hot water, and cooking fuel. Natural gas is also used as an alternate vehicle fuel, in the form of Compressed Natural Gas ("CNG") or Liquefied Natural Gas ("LNG"). Most often, the vehicles fueled by CNG or LNG are large heavy trucks or city/county commuter buses, which are vehicles which would otherwise run on diesel fuel. The substitution of CNG or LNG fueled vehicles for diesel fueled vehicles results in fewer exhaust emissions and cleaner air.

The breakdown of California's natural gas consumption over the most recent four years of available data, by category of use, is shown in Table I, below:

Table I.
California's Annual Natural Gas Consumption 1999-2003
(million cubic feet)*

Deliveries of Natural Gas, By End-Use	1999	2000	2001	2002	2003
Residential	568,496 (25%)	516,730 (21%)	512,695 (21%)	510,995 (23%)	489,293
Commercial	244,701 (11&)	246,439 (10%)	245,795 (10%)	238,247 (11%)	197,684**
Industrial	725,948 (32%)	776,202 (32%)	666,462 (28%)	740,256 (33%)	710,300
Vehicle Fuel	1,841	2,022	2,714	2,798	***
Electric Generation	723,171 (32%)	893,377 (37%)	973,327 (41%)	726,627 (33%)	658,015
Total	**2,264,158**	**2,434,770**	**2,398,279**	**2,218,924**	***

* As reported by the U.S. Department of Energy, Energy Information Agency. ** 3/2003 – 12/2003. *** not available until 12/2004.

In California, natural gas deposits are found primarily in the southern (for example, Long Beach) and central (Kern County) areas of the state. Across the lower 48 states, natural gas is found in the Gulf of Mexico, primarily offshore Texas and Louisiana, and onshore in producing regions called "basins." The onshore producing regions of the U.S. which traditionally supply natural gas to California are the Permian Basin, located in Texas, the Anadarko Basin, located in parts of Texas, Oklahoma and Kansas, and the San Juan Basin, located in parts of Colorado, New Mexico, and Utah. A large, interconnected "grid" of long-distance interstate pipelines link these and other natural gas supply areas to local gas distribution companies. Typically, it is these local gas distribution companies that supply the households, schools, hospitals, businesses and vehicle refueling stations where natural gas is consumed.

The State of California produces approximately 15% or 1 billion cubic feet per day ("Bcf/d") of the natural gas consumed within the state. To place this number into perspective, according to Kern River Gas Transmission Company, 1 Bcf of natural gas is sufficient to serve the needs of 5.9 million households over a 24-hour period. 75% of California's natural gas production occurs in association with oil production. About 85% of California's natural gas needs are met by importing natural gas. These imports come from producing basins in the southwest, midwest and rocky mountain areas of the U.S. Significant amounts of natural gas are also imported from Canada. Natural gas is imported into the state through a number of long-haul interstate pipeline systems. Together, these pipeline systems, the sources of natural gas they access, and the amount of natural gas (measured by thousands of cubic feet)the systems are physically capable of shipping into the California market are described in Table II. A map identifying the interstate pipelines serving California follows after Table II.

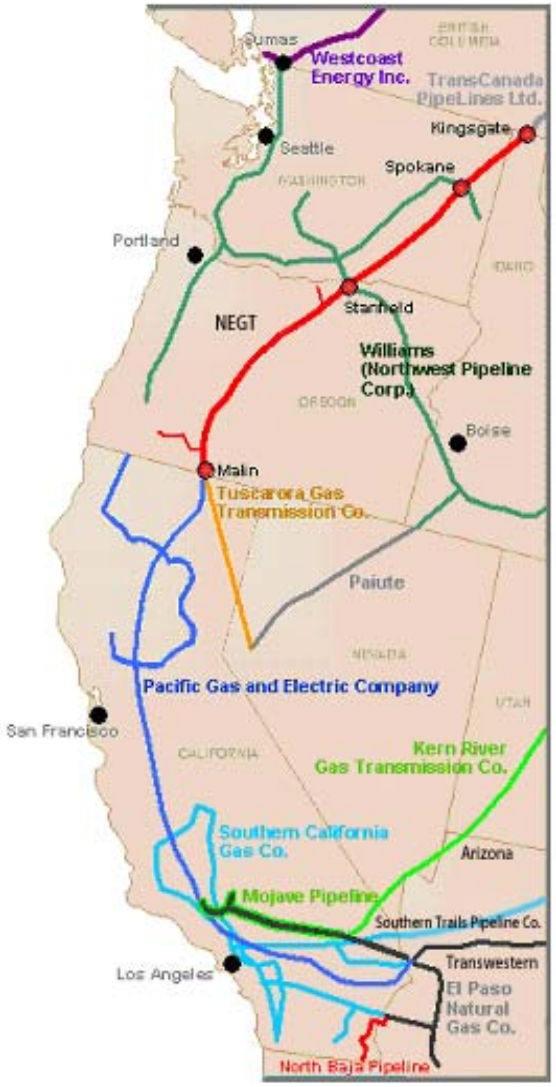
TABLE II.
Interstate Pipelines Serving the California Market (6/2004)

Interstate Pipeline System	Supply Areas Accessed	System Design Capacity Into California (Mcf/d)	Interconnecting California Systems or Locations
El Paso Natural Gas Company	San Juan, Anadarko, Permian Basins in Southwest/MidWest	3,290,000	PG&E, SoCal Gas, Mojave (Southern California)
Transwestern Pipeline Company	San Juan, Anadarko, Permian Basins	1,210,000	PG&E, SoCal Gas, Mohave (Southern California)
Kern River Gas Transmission Company	Wyoming, Rocky Mountain production	1,700,000	In-state electric generators in Kern County, PG&E, Mojave P/L Co.
Mojave Pipeline Company	Interconnection with El Paso and Transwestern at Topock, AZ	400,000	Kern River (Southern California)
North Baja Pipeline Company	Interconnection with El Paso near Ehrenberg, AZ	500,000	SoCal Gas near Blythe, CA; potential to transport Mexican gas for import by SDG&E

TABLE II. (cont'd)

Interstate Pipeline System	Supply Areas Accessed	System Design Capacity Into California (Mcf/d)	Interconnecting California Systems or Locations
National Energy & Gas Transmission (formerly, GTN)	Primarily Canadian exports from western Alberta production	2,100,000	PG&E, Tuscarora (Northern California)
Southern Trails Pipeline	San Juan Basin, Rocky Mountain production through interconnection with TransColorado Gas Transmission Co.	120,000	SoCal Gas, PG&E (Long Beach, CA)
Tuscarora Gas Transmission Company	Interconnection with NEGT at CA/Oregon border	2,100 (approximate)	City of Susanville, CA Dept. of Corrections (Northern California

Interstate Pipeline Systems Importing Natural Gas Into California (6/2004)



Liquefied Natural Gas ("LNG")

LNG is not a commodity distinct from natural gas. LNG is merely another medium, or form, by which natural gas can be transported, stored, or delivered. For this reason, all of the uses for natural gas which originates from within-state production or by imported natural gas from long-haul pipelines, can also be met from natural gas which first enters the state or the state's offshore waters in the form of LNG. Once imported LNG is processed to reduce its energy, or thermal, value it can substitute for any of the state's uses of natural gas. LNG's appeal is in its abundance, pricing, high methane content, purity from chemical contaminants, and ability to enter the market at points which by-pass congestion on existing pipeline systems.

LNG is generally thought of as the method by which natural gas produced overseas can be shipped to the United States and other natural gas consuming nations. The first LNG supplies to enter the U.S. originated exclusively from Algeria, but over the past four years, the single largest exporter of LNG to the U.S. has been Trinidad-Tobago. LNG is also sourced from Pacific Rim countries such as Indonesia and Australia, although at present LNG from those sources is largely consumed in Japan, Taiwan, Korea, and other far-eastern countries. LNG from the Middle East primarily serves markets in Europe, although LNG from Qatar and Oman is imported into the U.S.

LNG is shipped from abroad through double-hulled ships ("tankers") which sometimes reach lengths of 900 feet or more. These tankers hold the equivalent of 2.8 billion cubic feet of natural gas. These tankers dock at ports where facilities have been constructed to unload, process, store and redeliver the LNG. These unloading facilities are called terminals. Unloading one shipload of LNG generally takes 12 hours. In most instances, the unloaded LNG is stored just long enough for it to be either trucked to customers or regasified and delivered into pipelines owned by other entities. Very recent advances in technology now make it possible to locate these terminals dozens of miles offshore. At offshore terminals, the LNG is processed back to its gaseous state and the end product is transported onshore through underwater pipelines. LNG can also be transported over the road through refrigerated tanker trucks, each tanker truck holding between 10,000 to 12,000 gallons of LNG.

Presently, the price at the wellhead for natural gas produced outside North America and converted to LNG is typically significantly lower than natural gas produced in North America. However, this wellhead price is not the same as the price paid after the gas is converted to LNG and redelivered to consumers in the U.S. The price paid by U.S. consumers must also include the cost of processing the natural gas into LNG, shipping it to the United States, and then converting the LNG back into a gas.

Years ago, when North American natural gas prices fell, LNG was priced above domestic production and LNG deliveries into the U.S. were largely suspended, although minimal deliveries continued at two of the nation's four then-existing terminals. However, as North American natural gas prices increased in more current years, foreign LNG deliveries resumed. At present, North American natural gas prices are being

maintained by the market at the level where new foreign LNG shipments can compete with current gas supplies. As North American production increases in price, introduction of foreign LNG into California's energy markets can hold the line or lower the cost of the state's energy. Apart from pricing considerations, LNG offers the opportunity to make up for depleted domestic natural gas supplies and lower export levels from Canada. U.S. Government officials and agencies characterize future foreign LNG shipments into the U.S. as an important part of the nation's overall strategy to meet our energy needs in the years ahead. Table III, below, identifies current LNG terminals in the U.S. Table IV, below, identifies new LNG terminals, both onshore and offshore, proposed for U.S. markets.

TABLE III.
Existing LNG Import Terminals, U.S. (6/2004)

Name – Project Sponsor	Location	Current Send Out Capacity / Planned Expansion (Mcf/d)	Comments
Lake Charles – CMS Energy thru Trunkline LNG	Lake Charles, LA; onshore terminal	630,000 / 1,200,000	One of the original 4 U.S. terminals to import Algerian LNG; opened in 1982, closed shortly thereafter, re-opened in 1989 and in continuous use since.
Everett – Tractebel (a Belgium company)	Everett, MA; onshore terminal	435,000 / 915,000 (pipeline) 90,000 (truck)	First LNG import terminal in U.S.; in continuous operation since 1971; delivery by downstream pipeline; local distribution company affiliate trucks LNG to New England markets.
Elba Island – El Paso Energy	Elba Island, GA; onshore terminal	446,000 / 806,000	One of the original 4 U.S. terminals to import Algerian LNG; began operations in 1978, was mothballed in 1980 and reactivated in 2002.
Cove Point LNG – Dominion Resources	Cove Point, MD – onshore terminal	750,000 / 1,000,000	One of the original 4 U.S. terminals to import Algerian LNG; began operations in 1978, was mothballed in 1980, used for storage and peak day service since 1995; import terminal reactivated in 2003.

TABLE IV.
Proposed LNG Import Terminals, U.S. (6/2004)

Name – Project Sponsor	Location	Capacity (Mcf/d)	Comments
Cabrillo Port – BHP Billiton	Oxnard, CA – offshore	1,500,000	Application accepted by Coast Guard 1/2004
Crystal – Crystal Energy	Oxnard, CA – offshore	1,250,000	Application filed with Coast Guard 1/2004, deemed deficient.
Sound Energy Solutions – Mitsubishi	Long Beach, CA – onshore	1,000,000	Application filed with FERC 2/2004.
Mar Adentro – ChevronTexaco	Baja California – offshore	250,000 (net export to U.S.)	Filed with Mexican regulators in 2003.
Costa Azul LNG – Sempra/Shell	Baja California – onshore	1,750,000 (net export to U.S.)	Approved by Mexican regulators.
Cameron LNG – Sempra Energy	Hackberry, LA- onshore terminal	1,500,000	Approved by federal regulators 9/2003.
Port Pelican - ChevronTexaco	LA - offshore terminal	1,600,000	Approved by Coast Guard and Maritime Admin. 11/2003.
Energy Bridge - Excelerate	LA – offshore terminal	500,000	Approved by Coast Guard and Maritime Admin. 12/2003.
Freeport LNG – Freeport/Cheniere/Contango	Freeport, TX – offshore terminal	1,500,000	FERC environmental review concluded 5/2004.
Main Pass Energy Hub – McMoRan Exploration	LA – offshore terminal	1,000,000	Application filed with Coast Guard 3/2004.
Compass Port – ConocoPhillips	AL – offshore terminal	1,000,000	Application filed with Coast Guard 4/2004.
Gulf Landing - Shell	LA – offshore terminal	1,000,000	Coast Guard accepted application for filing 1/2004.
Corpus Christi LNG – Cheniere/BPU	Corpus Christi, TX – onshore terminal	2,600,000	Application filed at FERC 12/2003.
Golden Pass – ExxonMobil	Sabine, TX – onshore terminal	1,000,000	Prefiling environmental review by FERC.
Ingleside Energy Center – Occidental Petroleum	Ingleside, TX – onshore terminal	1,000,000	Prefiling environmental review by FERC.
Port Arthur – Sempra Energy	Port Arthur, TX – onshore terminal	1,500,000	Prefiling environmental review by FERC.
Sabine Pass – Cheniere	Sabine Pass, LA – onshore terminal	2,600,000	Application filed at FERC 12/2003.
Vista del Sol – ExxonMobil	Quintana Island, TX – onshore terminal	1,000,000	Prefiling environmental review by FERC.
Crown Landing – British Petroleum	Logan Township, NJ – onshore terminal	1,200,000	Prefiling environmental review by FERC.
Key Span LNG – Key Span/BG Group	Providence, RI – onshore terminal	525,000	Application filed at FERC 4/2004.
Weaver's Cove – Poten	Fall River, MA – onshore terminal	800,000	Application filed at FERC 12/2003.

LEGEND

Terminals Proposed to Serve California Markets

Terminals Approved, Not Yet Constructed

Terminals Proposed, Pending Decision

Sources: U.S. LNG Markets and Uses, U.S. Energy Information Administration (June 2004 update): Liquefied Natural Gas White Paper, Charles R. Matthews, Texas Railroad Commission (May 2004).

Natural gas is not found in a liquid state, thus there are no LNG wells. Instead, LNG is the result of cooling natural gas to approximately 260 degrees below zero. This cooling both liquefies and condenses the natural gas so that it occupies a space approximately 600 times smaller than when in its gaseous state. With this massive shrinkage, it becomes very efficient to transport large amounts of natural gas in a liquefied state. In a liquid state, LNG is heavier than air, although once it warms to approximately minus 160 degrees, it becomes lighter than air. In its liquid state, LNG is not flammable or explosive.

The process of cooling natural gas to a liquid state is called "liquefaction." The process of restoring the LNG to its gaseous state is called "regasification" or "vaporization." Liquefaction and regasification have the incidental effect of removing many of the impurities commonly found in natural gas when it leaves the wellhead. This results in a higher energy (or btu) content, compared to natural gas at the wellhead. Regasified LNG can be as much as 98 percent methane. When LNG warms sufficiently to revert to a gaseous state it is still colder than the surrounding atmosphere. For this reason, if released to the atmosphere it would typically appear as a white mist, as water vapor condenses from the surrounding atmosphere. In concentrations of less than 5% or greater than 15%, this gas is not flammable; when unconfined, it is not explosive.

In addition to a 10,000 gallons per day experimental technology demonstration plant located in Sacramento and owned by Pacific Gas & Electric ("PG&E"), there are eight other liquefaction plants located in California. These other facilities are owned by governmental entities or large scale commercial vehicle users. For example, the City of Santa Monica owns the liquefaction facilities used to produce LNG for its fleet of LNG-fueled transit buses, as does the Orange County Transit Authority. In certain areas of the state third parties can acquire liquefaction services for their own supplies of natural gas. For example, PG&E sells liquefaction service for customer-owned natural gas, pursuant to a tariff approved by the California Public Utilities Commission. As of 2003, there were 28 privately or publicly-owned LNG vehicle fueling stations across the state.

To date, no LNG import terminals have been constructed within the State of California or in its adjacent coastal waters. However, LNG is still used within the state as an alternative fuel for transit buses (the largest being the City of Santa Monica and the Orange County Transit Authority), trash haulers (Cities of San Diego and Sacramento, Riverside County, GTI Rubbish, Norcal Waste Management, and Waste Management, Inc.), and heavy duty trucks, including semi-trucks used in the fleets of several major grocery chains (Vons, Raleys/Bel Air, and Sysco Food Services). A portion of this vehicle fuel comes from LNG liquefaction facilities located in the state (including the 10,000 gallons per day facility located in Sacramento) and the remainder is trucked into the state from plants located in Wyoming, the Pacific Northwest, and Topock, Arizona. Each truckload of LNG totals between 10,000 to 12,000 gallons. Some LNG tanker trucks are equipped with vaporizers which allow the LNG to be trucked to a site which

requires temporary, supplemental natural gas for immediate use. The largest single source of LNG used in California is a plant owned by an affiliate of El Paso Natural Gas Company. This plant, located near Topock, Arizona, supplies California with approximately 29,000 gallons per day of LNG.